

ANSA PRE-PROCESSING STRATEGIES FOR MULTIPHYSICS SIMULATION OF MOTORCYCLE HELMET

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ABSTRACT –

Nolangroup is one of the leading manufacturers of motorcycle helmets worldwide. It owns the commercial helmet brands Nolan, X-Lite and Grex.

Traditionally, Nolangroup helmet design has been based on physical experiments using prototypes. In order to enhance its helmet design capabilities and reduce costs and time to market, Nolangroup have recently introduced simulations in the fields of external and internal aerodynamics, thermal and humidity exchanges, vibroacoustics for noise transmission and crash impacts.

In the framework of EU funded project Fortissimo, collaborating with MoxOff S.p.A. (technology expert) and Cineca (HPC provider), Nolangroup developed a dedicated multiphysics platform named HPCASCo which, through a customized GUI, enables automatic simulations set-up and parametrization, interfaces with the HPC scheduler system and remotely post-processes the results producing simulation reports.

The main task for Nolangroup engineers is still in the preparation of discretized computational models. In this paper we explain how we intensively exploited the ANSA software package in the pre-processing of all simulation workflows.

We first illustrate our procedure for watertight geometry preparation and batch meshing for OpenFOAM CFD simulations, then we show how we build LS-DYNA FEA crash models based on thickness shell for polycarbonate components and solid volumes for crushable foams. Finally, the main constraint of the open source code SPEED (SPectral Elements in Elastodynamics with Discontinuous Galerkin) adopted in vibroacoustic simulations is that it requires structured full-hexahedral mesh. To this aim, we developed an original meshing strategy, consisting in full-quad meshing of the external helmet surface and intruding/morphing layers of hexahedrons to fill the volume occupied by the various materials of the helmet.